Consequences of Climate Change

In the following module, there is a list of activities that can be utilized to have conversations about the consequences of climate change. The first activity utilizes the Flood Factor Tool to study future flood risk in Morgantown, WV. The second activity utilizes the WV Flood Tool and story-mapping to understand further flood impacts and risks in West Virginia. The third activity on climate justice has students read 3 short articles and write responses to broad discussion questions about the inequities associated with future climate change impacts.

Activity 3.2 - WV Flood Tool Mapping Activity: Greenbrier County, WV

Background:

The goal of the activity is to study the impacts of the 2016 floods in West Virginia to think about the impacts of future flooding in the state, and how governments and individuals can better prepare for them. Students begin by exploring two Story Maps related to the 2016 floods and answering questions related to the causes and impacts of the floods. They then use the West Virginia flood tool to help students understand the risks of flooding for communities in WV, and to consider potential solutions. Using the tool, students will explore flood risk in Greenbrier County, WV, where large-scale flooding occurred in June of 2016. Next, they will explore flood risk in their own communities. Finally, they will use all information in the activity to consider potential solutions to mitigate the human impacts of future flooding. By the end of this activity, students will also be able to utilize online mapping software to research flood risk.

Part 1: Story Map on Flooded Towns

1. Access the following story map: https://wvu.maps.arcgis.com/apps/Cascade/index.html?appid=7b98379452094cd6827dc8f09c8293bd

2. Read through the material under the header ‘Stationary Storm.’

Question: What caused the flash floods on June 23rd and 24th, 2016? What were some of the impacts of this flood?

3. Read through the material for the town of Clendenin.

Herbert Hoover High School

Question: How were the students who attended Herbert Hoover High School affected?

4. Read through the material for the town of White Sulfur Springs and the Greenbrier Resort.


Greenbrier Resort

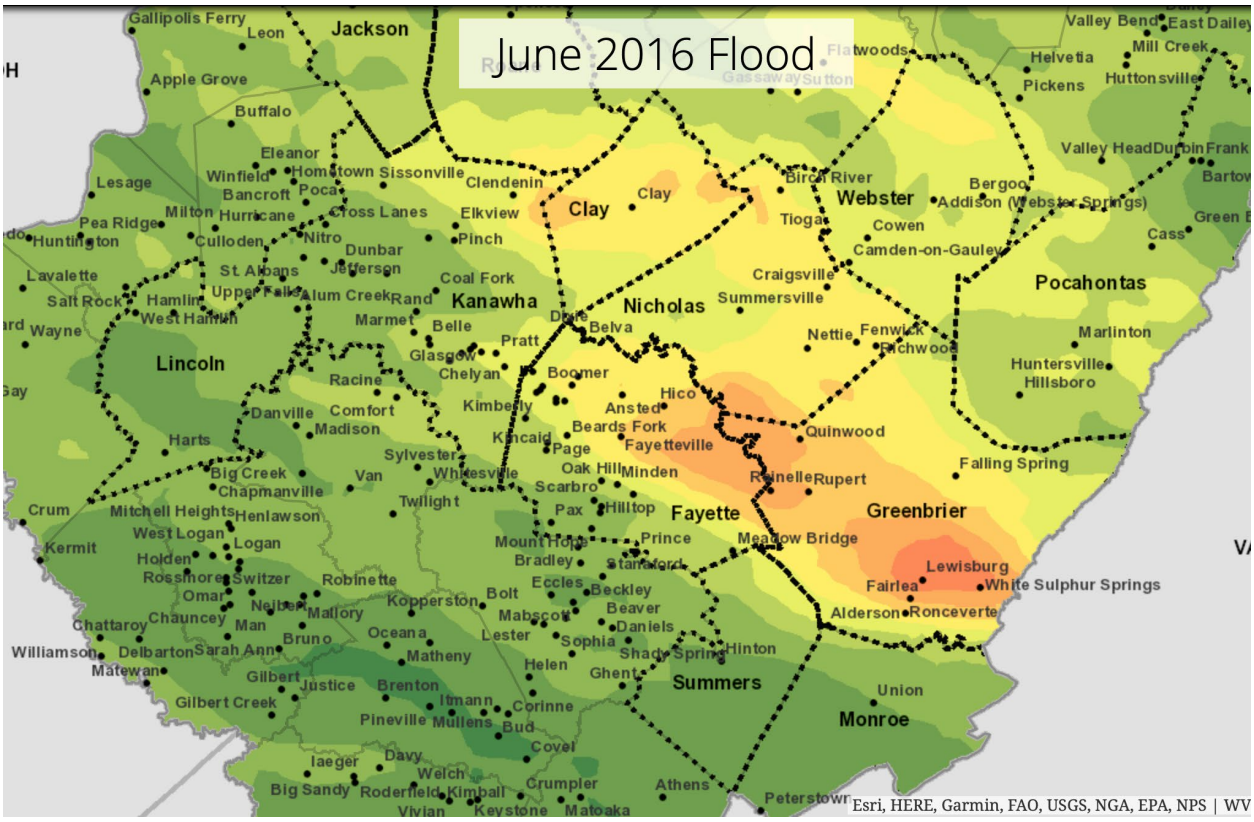
Question: How did the Greenbrier Resort help the community of White Sulfur Springs following the floods? What are some ways that Greenbrier Resort helped displaced victims?

5. Read through the material presented under ‘Resilience.’

Question: Though the floods caused widespread damage and some lives were lost, what were some outcomes of the floods in regards to FEMA flood maps?

Part 2: Lessons Learned from the 2016 Floods

1. Access the following story map: https://www.arcgis.com/apps/Cascade/index.html?appid=32292859b21b44e99c0be706f6da8aa3



2. Read through the material under the heading ‘Lessons Learned’

<u>Lesson 1: Flood Insurance Matters</u>

Question: Why is having flood insurance important? Why does FEMA encourage homeowners and renters to purchase flood insurance?

Lesson 2: Flooding and Rainfall are Different

Question: What are some characteristics of rainfall events that have the potential to cause flooding events? Name 3 discussed in this section.

Lesson 3: High Intensity Storms May Become More Common

Question: Why might high-intensity storms become more common in the future? How might climate change affect this phenomenon?

1. Read through the material under the heading ‘Mitigating Risk.’

Question: What is the goal of mitigation? How is mitigation achieved?

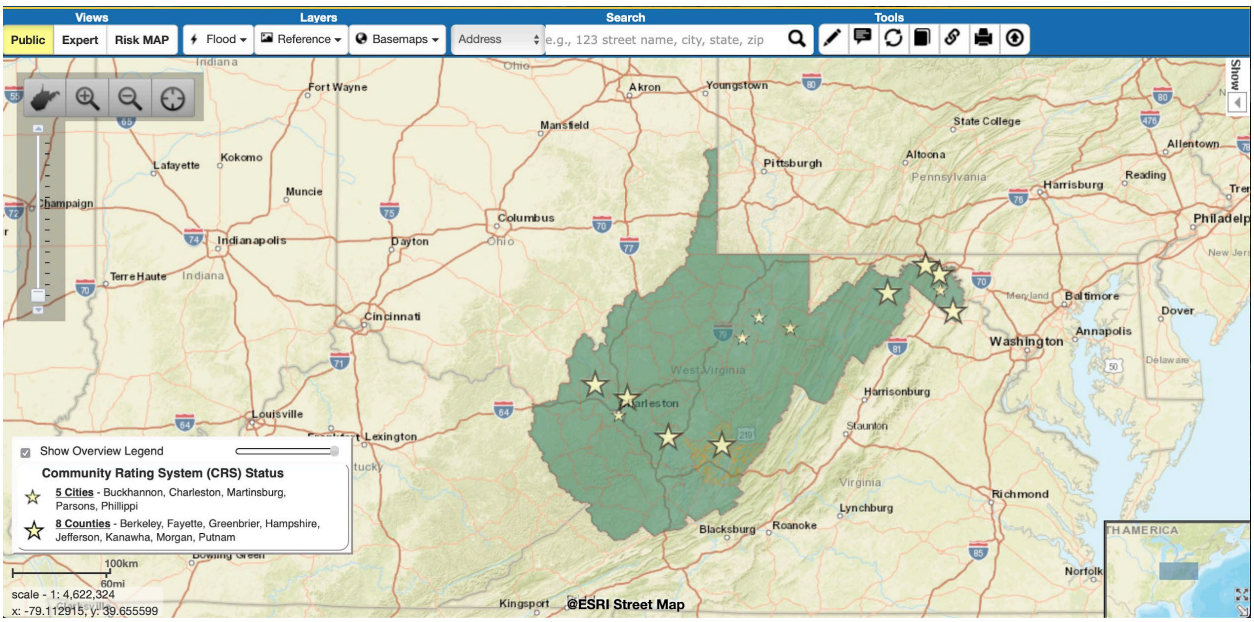
Question: What can local governments do to address risk? Name 2 actions.

Question: What can individuals do to address risk? Name 2 actions.

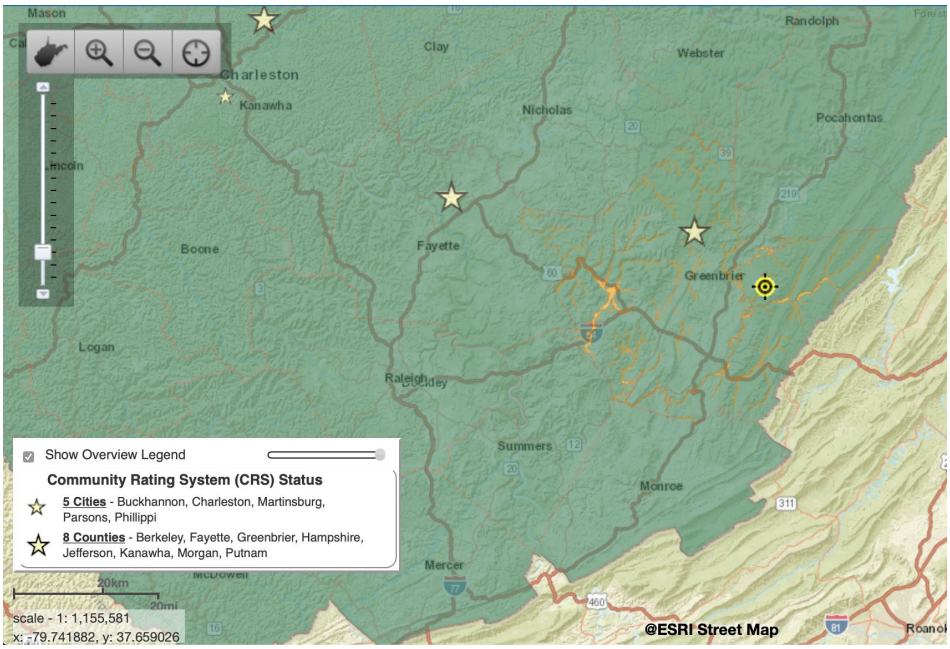
Part 3: Assessing Flood Risk

1. Open the West Virginia Flood Tool: http://www.mapwv.gov/flood/

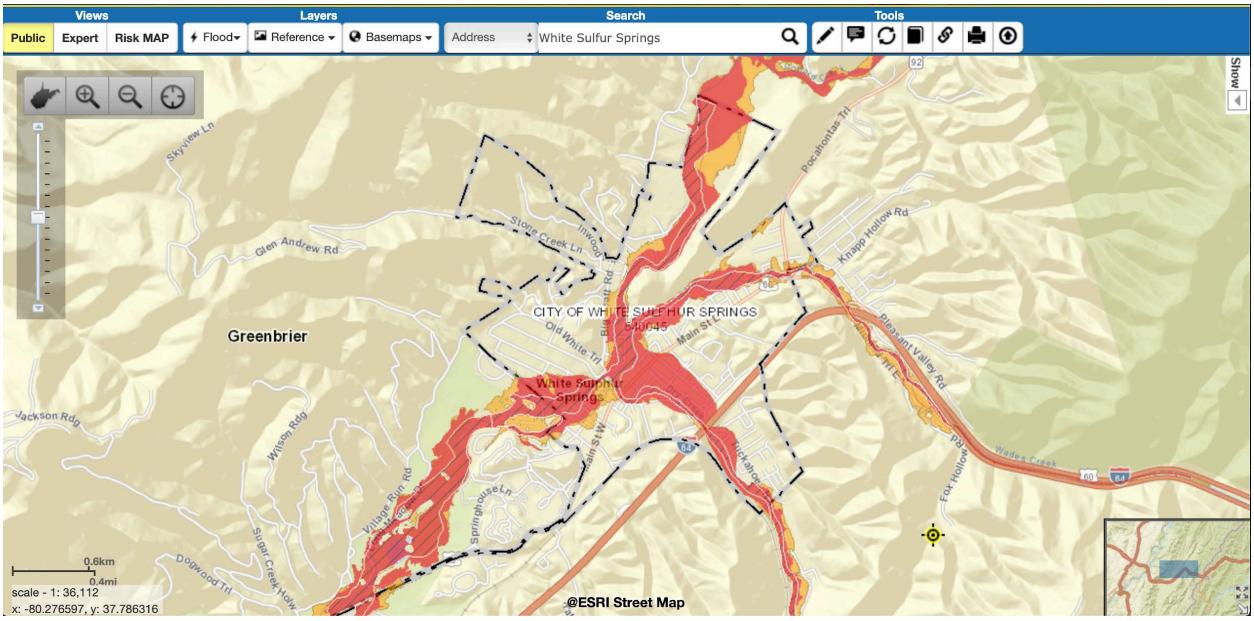
2. Click 'Launch Map'



3. Use the bar on the left hand side of the screen to zoom into Greenbrier County, located in the southeastern corner of West Virginia.



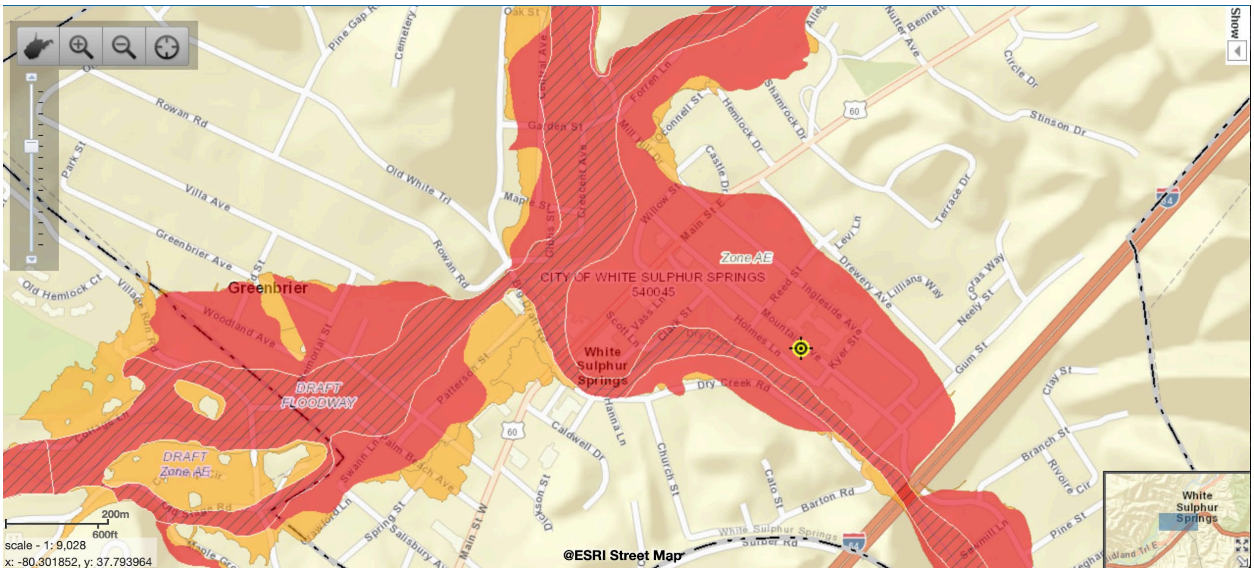
4. Locate the town of White Sulfur Springs on the map of Greenbrier County. You can either zoom into the map to where White Sulfur Springs is located, or you may type in ‘White Sulfur Springs’ at the top of the screen where it says ‘Search: Address’. Click enter.



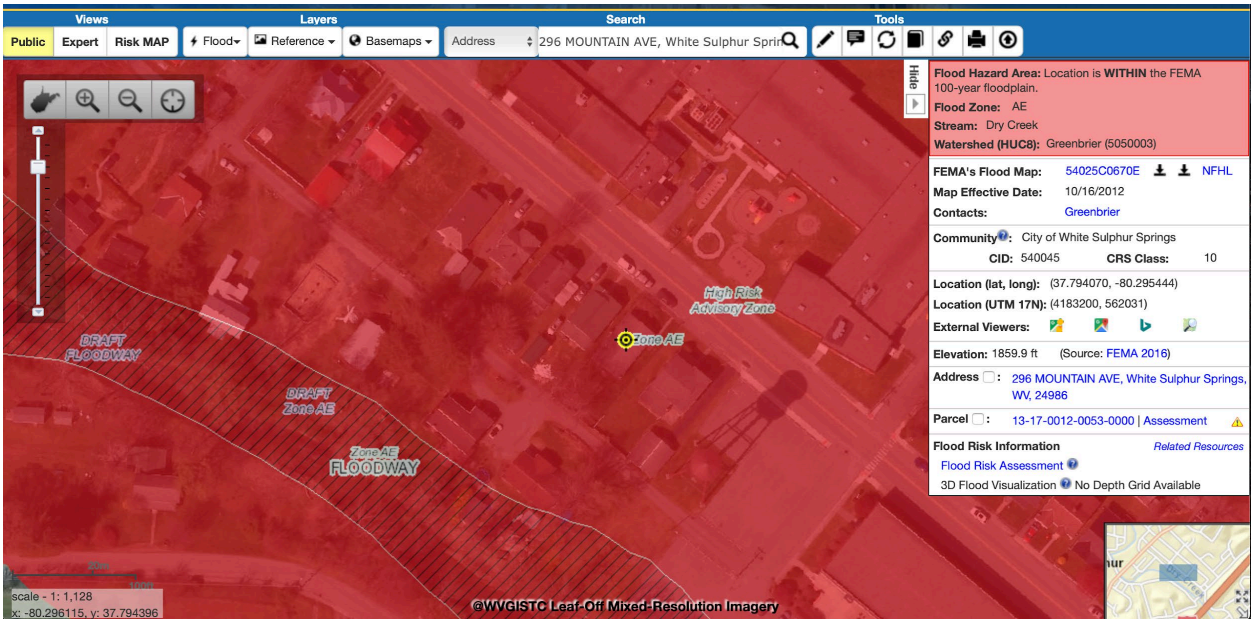
5. If you zoom in further, you can see that most of the town is located within a floodplain. The mapping tool shows the 100-year floodplain of all rivers, streams, creeks and other bodies of moving water in a particular area.

According to FEMA, the **100-year floodplain** is described as an area with a 1% annual chance of flooding.

Question: Is 1% annual chance of flooding high-risk or low-risk to the community? Why or why not?

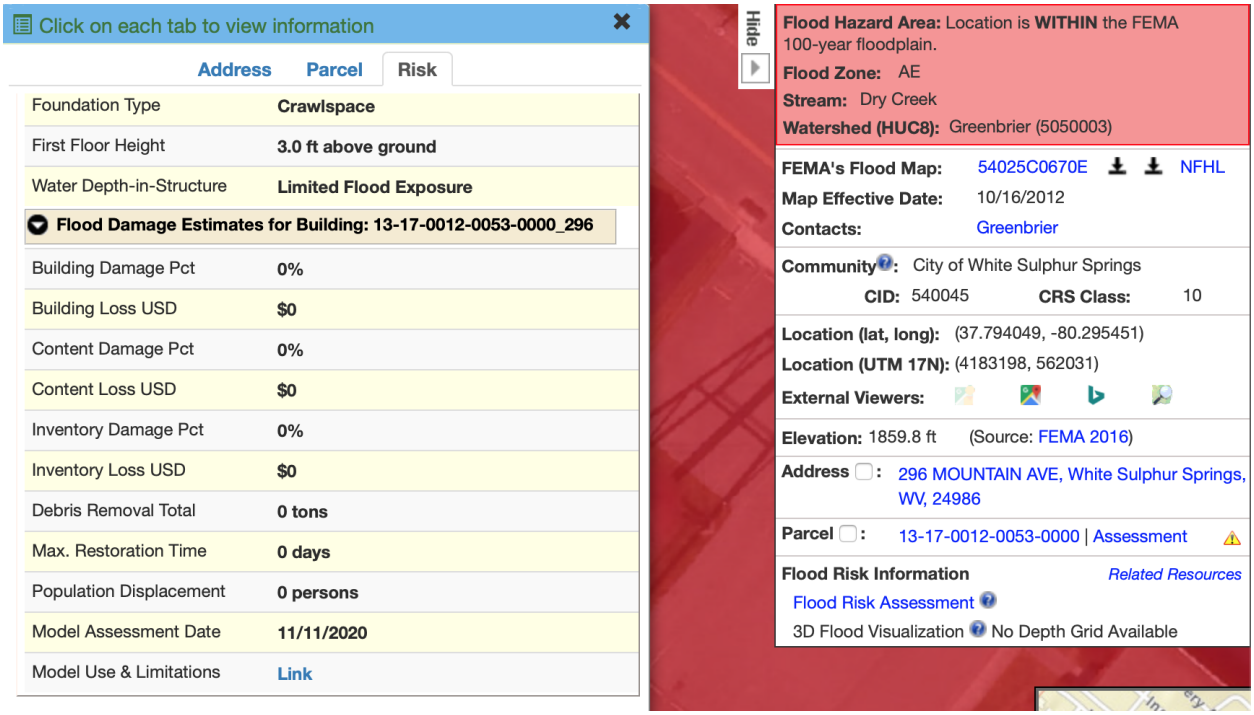


6. Type in the address: 296 Mountain Avenue, White Sulphur Springs, WV, 24986 into the search bar. According to the mapping tool, this address is located within the FEMA 100-year floodplain.



7. On the map above, you'll also notice that the address is within a High Risk Advisory Zone, and in near proximity to a floodway. A **floodway** is described as an area of the floodplain where a large discharge of water occurs during floods. If this particular area were to become blocked or even partially blocked with debris or other material, the floodway is able to redistribute flood flow, or a significant increase in flood level.

8. Under the heading 'Flood Risk Information' on the right hand side of the screen, click 'Flood Risk Assessment.



9. Look at the 'Risk' tab. Under Flood Damage Estimates for Building, there is information as to whether or not this structure was damaged by a flood before.

Question: Has this structure been damaged in previous flooding events? Does the structure have a high risk to be damaged in the future?

Question: Does being near a floodway put you at more risk to flooding impacts?

10. Utilizing the search tool, locate your own address.

Question: Is your address located within a 100-year floodplain?

Question: Do you think your home is more at risk to flooding as precipitation changes over time as a result of climate change? Why or why not?

Question: How might researching risk help protect you against flooding impacts in the future?

Future Solutions:

Question: What do you think your local government could do to help prepare for future flooding? Think of your town and areas of risk.

Question: What do you think individuals in your community can do to prevent negative impacts of future flooding?

Activity 3.2 - Flood Factor Activity: Morgantown, WV

Background:

The goal of this activity is to study future flood risk in Morgantown, West Virginia utilizing the website Flood Factor. Flood Factor is a tool created by the First Street Foundation to allow people to understand their property's flood risk and to educate them on how flood risk changes in a changing environment. Students begin by exploring if flood risk is increasing or decreasing in Morgantown. Then, they answer questions about Morgantown's Flood Factor, and where particular places in Morgantown are most at risk. At the end of the activity, there are open-ended questions where students can write about what solutions should be taken in Morgantown to decrease flood risk.

1. Access the Flood Factor tool here: https://floodfactor.com
2. Type in the zip code '26505' into the "Find Your Home's Flood Factor" box in the middle of the screen.

Summary:

Question: How many homes in Morgantown are 'at risk'? What does 'at-risk' mean? (Hint: click 'at risk' underneath the heading "Morgantown has flood risk")

Question: Is there a change in the number of properties at risk over a 30-year period? Is there a change in the total annual flood damages over a 30-year period?

Question: Are you surprised by these changes? What environmental factors might be associated with this assessment?

Score Map:

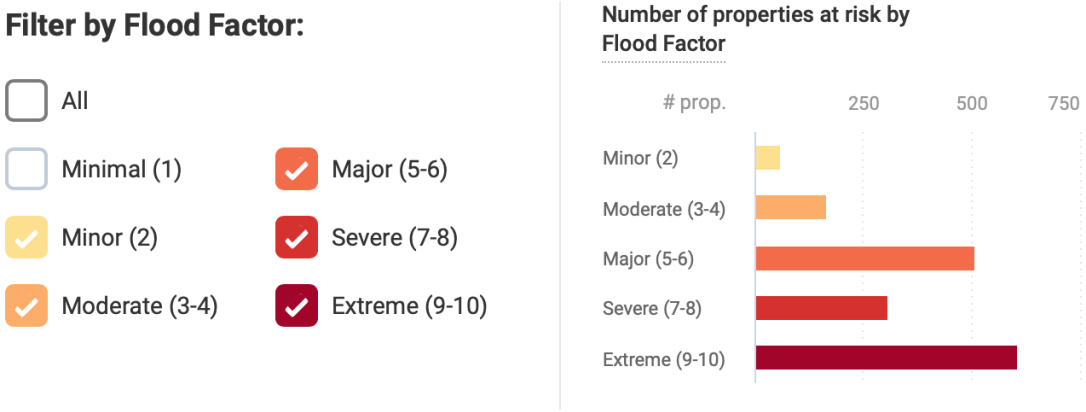
3. Scroll down to 'Score Map'
4. Click on 'Learn more about the Flood Factor methodology"
5. Scroll down to 'Analyzing all major flood types'

Question: What types of flooding are included in Flood Factor analysis?

6. Click on ‘Rain’, ‘Ravine’, ‘Tidal’, or ‘Storm Surge’

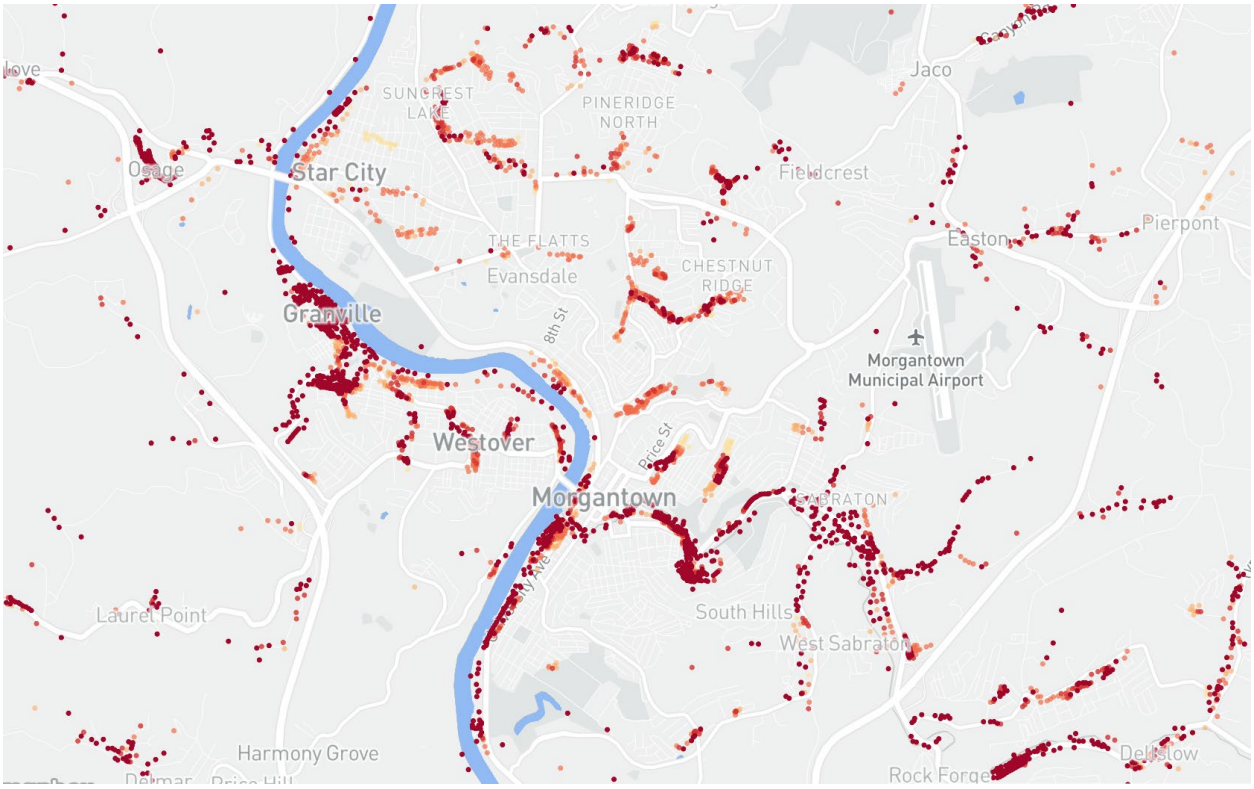
Question: Describe when one of the four flooding types occurs and why it occurs in a given area.

7. Go back to ‘Score Map’



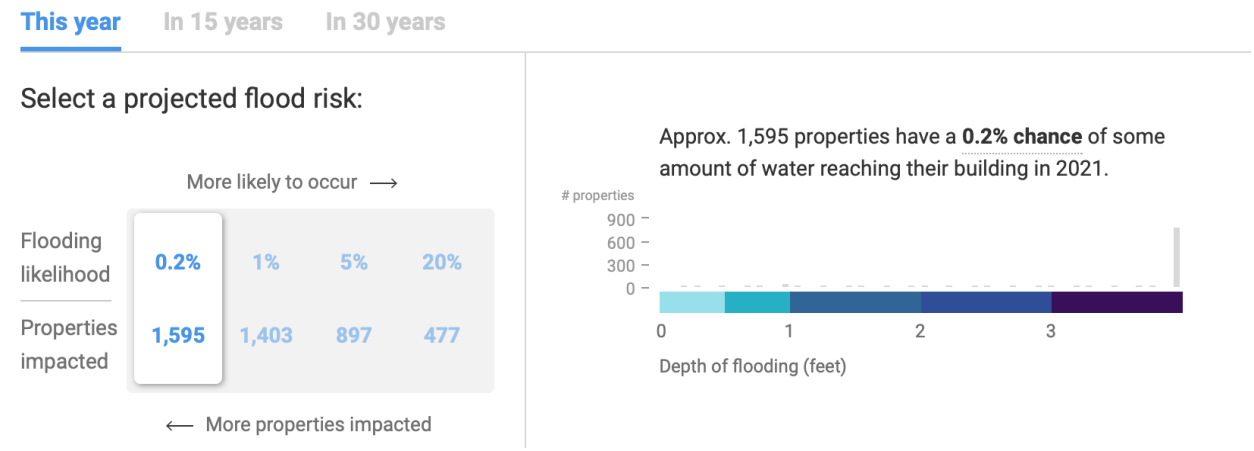
Question: How many properties are at risk by the Flood Factor in Morgantown? What type of Flood Factor [from minimal to extreme] has the highest percentage in Morgantown?

8. Looking at the map of Morgantown and the surrounding areas (Westover, Granville, Star City).



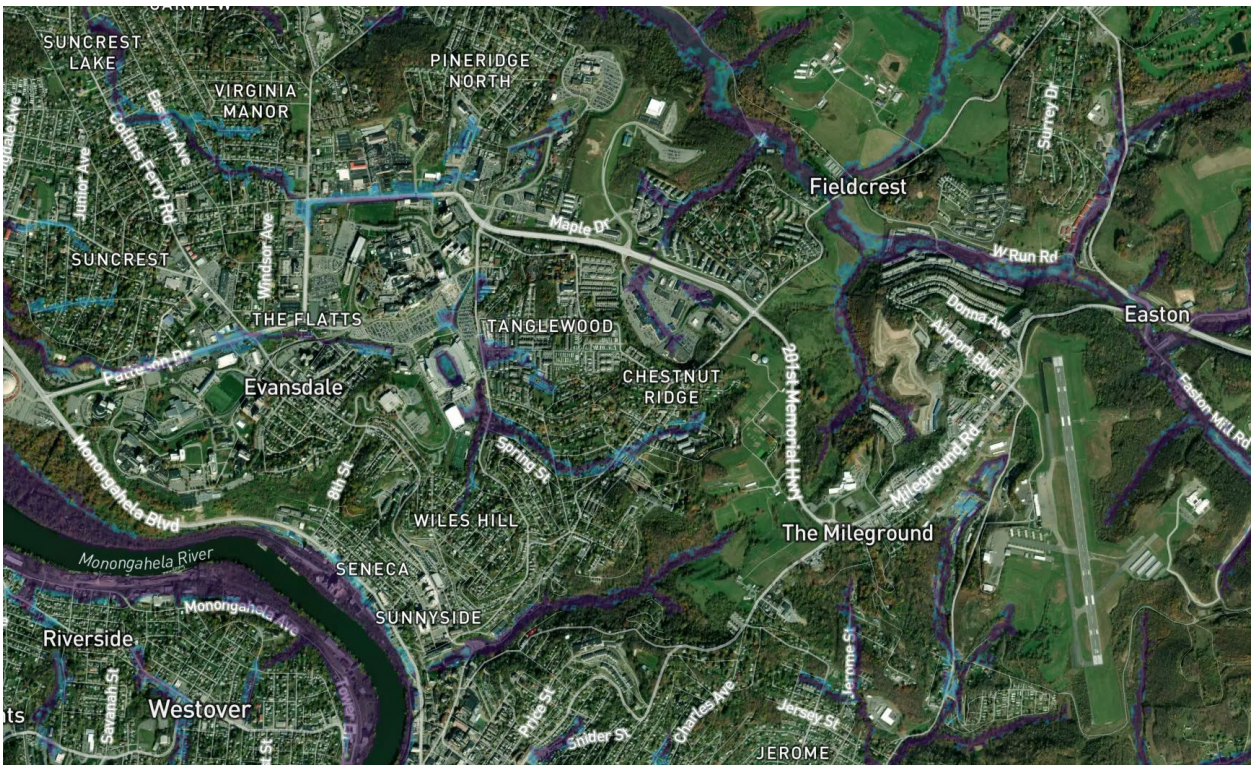
Question: Where are there areas of properties that might be exposed to extreme flooding? What sort of environmental factors might make these areas more prone to flooding?

9. Scroll down to ‘Flood risks vary by depth and likelihood’
10. Using the interactive panel below this heading, answer the following questions.



Question: Does the number of properties in Morgantown under a 20% chance of flooding increase or decrease in the future? What factors might cause this increase or decrease?

Question: Describe on the map below where changes in projected flooding risk occur.



Environmental Changes:

11. Using the interactive panel, answer questions below regarding projected environmental changes.

Question: How is precipitation change projected this year in West Virginia? What about in 15 years? In 30 years?

Question: How is sea level rise projected this year on the east coast of the US? What about in 15 years? In 30 years? Where are places on the east coast that have the highest projected sea level rise in 30 years?

Question: How is sea surface temperature projected this year on the east coast of the US? What about in 15 years? In 30 years? Where are places on the east coast that have the highest projected sea surface temperature increases?

Question: Why might these three projections (precipitation change, sea level rise, and sea surface temperature) be utilized to assess flood risk?

Community Solutions:

Question: What is an example of green infrastructure that can be implemented to better protect Morgantown?

Question: What is an example of grey infrastructure that can be implemented to better protect Morgantown?

Question: What is an example of resilience that can be implemented to better protect Morgantown?

Activity 3.3 - Climate Justice

Read the following public-focused media pieces on climate justice and answer corresponding discussion questions:

1. Read the following article: https://yaleclimateconnections.org/2020/07/what-is-climate-justice/

Question: How is climate justice defined? What are the key factors to consider when thinking about climate justice?

Question: How might climate justice be applied to issues of flooding in Appalachia?

Question: What are some ways in which climate justice initiatives can be implemented in Morgantown?

2. Read the following article: https://www.washingtonpost.com/climate-solutions/2020/06/29/climate-change-racism/

Question: How are issues of climate change and racism interconnected? Which groups suffer the most due to climate change impacts?

Question: Why might communities of color be more susceptible to climate change impacts than white neighborhoods?

Question: How are children of color spearheading the youth climate movement?

3. Read the following article: https://rachelcarsoncouncil.org/hurricanes-and-marginalization-how-climate-disasters-affect-lgbtq-persons/

Question: How are issues of climate change, racism, and homophobia interconnected?

Question: How might hurricanes and other natural disasters exacerbated by climate change affect marginalized groups in the future?

Question: What are ways in which LGBTQ+ persons are vulnerable in every-day activities?

Overall Discussion Questions:

How might issues of climate change, racism, and homophobia, among others, affect the people who live in Appalachia?

Who benefits from uneven climate change impacts?